

METHOD 6C - DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

Applicability and Principle

A sample is continuously extracted from the effluent stream portion of the sample stream and conveyed to an instrumental analyzer using either ultraviolet (UV), nondispersive infrared (NDIR), or fluorescence for the determination of SO₂ concentrations. Performance specifications and test procedures are provided to ensure reliable data. If a fluorescence-based analyzer is used, special calibration gases/procedures will be used as detailed in Section 5.3 of the method.

The principle of detection to be used during the test program will be _____.

Apparatus

A **measurement system** for Sulfur Dioxide that meets the specifications of this method will be used.

The **Sample Probe** will be glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe shall be heated to prevent condensation.

The **Sample Line** will be heated (sufficient to prevent condensation) stainless steel or Teflon® tubing, to transport the sample gas to the moisture removal system.

The **Moisture Removal System** will be a refrigerator-type condenser or similar device to continuously remove condensate from the sample gas while maintaining minimal contact between the condensate and the sample gas.

The **Sample Transport Lines** will be stainless steel or Teflon tubing, to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and sample gas manifold.

A **Calibration Valve Assembly** with a three-way valve assembly, or equivalent, for blocking the sample gas flow and introducing calibration gases to the measurement system at the outlet of the sampling probe when in the calibration mode will be utilized.

A **Particulate Filter**, either an in-stack or heated (sufficient to prevent water condensation) out-of-stack filter will be used. The filter will be borosilicate or quartz glass wool, or glass fiber mat. All filters will be fabricated of materials that are nonreactive to the gas being sampled.

A **Leak-free Pump**, to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system will be used. The pump will be constructed of any material that is nonreactive to the gas being sampled.

A **Recorder**, a strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute.

Analytical Range

The span of the monitoring system will be selected such that a pollutant gas concentration equivalent to the emission standard is not less than 30% of the span. If at any time during the run the measured gas concentration exceeds the span; the run will be considered invalid.

Allowable = _____ lb/hr

MW = 64 lb/lbmole

Stack Flow = _____ dscfm

The in-stack concentration based on the emission standard and stack flow parameters is

$\frac{(\text{lb/hr}) \times (387 \times 10^6)}{(\text{MW}) \times (\text{dscfm}) \times 60} = \text{_____ ppm}$. Therefore, the analyzer span will be _____ ppm.

Calibration Gases

All calibration procedures and acceptance criteria of Method 6C will be adhered to. The calibration gases will be (check one):

____ EPA Protocol No. 1 gases.

____ Gas mixtures certified by the manufacturer not to exceed $\pm 2\%$ of the tag value. If this method is used, concentration verification will be performed per Section 6.1.2 of the method and the documentation will be included in the final test report.

The calibration gases will be SO₂ in N₂, or SO₂ in air, or a gas mixture listed in Section 5.3 of the method.

The **zero gas** will be less than 0.25 percent of span. The zero gas concentration to be used during the source test will be _____.

The **mid-range** calibration gas will be equivalent to 40 to 60 percent of the span. The mid range gas to be used during the source test will be _____.

The **high-range** gas will be equivalent to 80 to 90 percent of the span. The high range gas to be used during the source test will be _____.

Analyzer Calibration

The analyzer calibration error check will be conducted by introducing the zero, mid-range, and high-range gases to the analyzer. During this check, no adjustments to the system will be made except those necessary to achieve the correct calibration gas flow rate at the analyzer. The analyzer responses to each calibration gas will be recorded. The analyzer calibration error check will be considered invalid if the gas concentration displayed by the analyzer exceeds ± 2 percent of the span for any of the calibration gases.

The sampling system bias check will be performed by introducing first an upscale gas (mid-range) at the calibration valve assembly installed at the outlet of the sampling probe, and then the zero gas. During this check, no adjustments to the system will be made except those necessary

to achieve the correct calibration gas flow at the analyzer. This check will be considered invalid if the difference between the calibration error check and the calibration bias check for the same calibration gas exceeds $\pm 5\%$ of the span.

Emission Measurement Test Procedure

A sample point that is representative of the source emission concentration must be selected. The sampling probe will be placed at the sample point and sampling will begin at the same rate used during the bias check. A constant rate ± 10 percent will be maintained during the entire sample run. Sampling will commence only after twice the response time has elapsed.

Immediately following the completion of the test period and hourly during the test period, the zero and mid-level calibration gases will be re-introduced one at a time to the measurement system at the calibration valve assembly. No adjustments to the measurement system will be made until both the zero and calibration bias and drift checks are made. The analyzer response will be recorded. If the bias values exceed the specified limits, the test results preceding the check will be invalidated and the test will be repeated following corrections to the measurement system and full recalibration. If the drift values exceed the specified limits, the run may be accepted but the test measurement system will be fully recalibrated and the results reported using Equation 6C-1.

Measurement System Performance Specifications

Zero Drift, less than or equal to ± 3 percent of the span value. **Calibration Drift**, less than or equal to ± 3 percent of span value. **Sampling System Bias**, less than or equal to ± 5 percent of span value. **Calibration Error**, less than or equal to ± 2 percent of span.

Emission Calculation

The average gas effluent concentration will be determined from the average gas concentration displayed by the gas analyzer and is adjusted for the zero and upscale sampling system bias checks, as determined in accordance with Section 7.4 of Method 6C. The average gas concentration displayed by the analyzer may be determined by integration of the area under the curve for chart recorders, or by averaging all of the effluent measurements. Alternatively, the average may be calculated from measurements recorded at equally spaced intervals over the entire duration of the run. Calculate the effluent gas concentration using Equation 6C-1.

$$C_{\text{gas}} = (\bar{C} - C_o) \frac{C_m}{C_m - C_o}$$

Emissions will be presented in the following units: _____.

Proposed Deviations from this BTS Template or the Method

(Insert any proposed deviations here)